Cooperative Decision Making in River Water Allocation Problems

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Rivers, and the bodies of water they flow into, constitute the most important regional source of fresh water in the world. Asymmetric dependence on water resources has been at the heart of several conflicts between upstream and downstream water users. Global institutions, such as the United Nations, have tried to reduce the number of these conflicts by promoting (the study of) multilateral agreements between water users. In this dissertation we present recent developments in the modeling of river water allocation problems by combining principles from international watercourse law with methods from (cooperative) game theory. More specifically, we focus on the problem of distributing the welfare that results from optimally allocating the water that flows in a river among the agents (e.g., countries, cities, firms) located along the river. We extend a single-stream river water allocation model from the literature to situations in which the river is allowed to have several tributaries (and distributaries). In addition, we allow the countries in an international river water allocation model to be composed of different water users. Finally, we also analyze the difference between the rival and non-rival use of river water by introducing a river pollution model.

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